DOCUMENT RESUME

ED 274 550 SE 047 250

AUTHOR Pedersen, Katherine; And Others
TITLE Parent Careers and Attitude toward Mathematics as a Male Domain.
PUB DATE Apr 86
NOTE 31p.; Paper presented at the Annual Meeting of the American Educational Research Association (67th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Careers; Educational Research; Junior High Schools; Junior High School Students; Models; *Parent Attitudes; Parent Background; *Parent Influence; Secondary Education; *Secondary School Mathematics; *Sex Differences; Sex Stereotypes; *Student Attitudes
IDENTIFIERS *Mathematics Education Research

ABSTRACT

The purpose of the study is to investigate the effects of parent career variables on student and parent attitudes toward mathematics as a male domain. The investigation was carried out from two different perspectives: comparisons across parent career categories and evaluation of a course model relating the study variables. The subjects were 1,942 junior high students. The variables were each student's and each parent's perception of mathematics as a male domain, the Holland occupational categories of the parents' careers, the education levels associated with the parents' occupations, the male dominance index of the occupations, and the sex of the child. The results indicated differences in perception of mathematics as a male domain across career categories. The computer program and statistical technique, LISREL, was used to evaluate the hypothesized model. A "best fitting" model was developed and analyzed. (Twenty-four references, five tables and two figures are included.) (Author)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Parent Careers and Attitude Toward Mathematics as a Male Domain

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Katherine Pedersen
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Katherine Pedersen
Carla Tayeh
Patricia Elmore
Dorothy Bleyer
Southern Illinois University
Carbondale, Illinois

ED274550

Paper Presented
to the
American Educational Research Association
San Francisco
April, 1986

SE 047 250

RUNNING HEAD: Parent Careers

Abstract

The purpose of the study is to investigate the effects of parent career variables on student and parent attitudes toward mathematics as a male domain. The investigation was carried out from two different perspectives: comparisons across parent career categories and evaluation of a course model relating the study variables. The subjects were 1942 junior high students. The variables were each student's and each parent's perception of mathematics as a male domain, the Holland occupational categories of the parents' careers, the education levels associated with the parents' occupations, the male dominance index of the occupations, and the sex of the child. The results indicated differences in perception of mathematics as a male domain across career categories. The computer program and statistical technique, LISREL, was used to evaluate the hypothesized model. A "best fitting" model was developed and analyzed.

Parent Careers and Attitude Toward Mathematics as a Male Domain

Mathematics as a male domain has been defined as the extent to which mathematics is perceived to be a subject more appropriate for males. It is this perception of mathematics as a male domain that has been shown to be significantly related to both mathematics achievement (Boswell, 1985, Fennema & Sherman, 1977); and to mathematics course participation (Armstrong & Price 1982; Sherman, 1981).

Boswell (1985) found that as early as elementary school, children began to stereotype mathematics as a male domain and that, for girls, the stereotyping of mathematics as a male domain was correlated with lower mathematics achievement scores. Fennema and Sherman (1977) came to a similar conclusion in a study of high school students. They found a modest relation between sex typing of mathematics as a male domain and lower mathematics achievement scores in grades 9-11; this relation existed only for girls. Sherman (1981) found that a low level of stereotyping of mathematics as a male domain at grade 8 was one of the major attitudinal predictors of girls' higher mathematics achievement at grade 11.

Sherman (1981) found also that the stereotyping of mathematics as a male domain by males was one of the most important factors affecting their continuation in the mathematics study sequence.

Armstrong (1985) found that, for 12th grade women, the women who did pursue advanced mathematics courses tended not to sex-type mathematics as a subject appropriate only for men. Eccles, Adler, Futterman et al (1985) concluded that stereotyping mathematics to be a male domain had a consistent effect on the decision to enroll in mathematics. People who sterotyped mathematics as a male domain saw it as having higher future utility, being more enjoyable, and being more valuable. Research suggests that parental influence strongly affects a student's course-taking, achievement in mathematics, and career aspirations through role modeling, through direct encouragement, and through expressions of positive attitudes toward mathematics. The exact nature of the cause-effect pattern was considered undetermined (Armstrong, 1985). A number of studies have supported various correlational relationships between parent attitudes and perceptions and student attitudes (Boswell, 1985; Parsons, Adler, & Kaczala, 1982; Poffenberger & Norton, 1959; Wilhelm & Brooks, 1980). Poffenberger & Norton (1959) indicated that student attitudes toward mathematics were culminative phenomena and were developed in the home in some cases before the child began school. Parsons, Adler, and Kaczala (1982) concluded that mothers had the stronger influence on children's achievement beliefs and attitudes; fathers appeared to have little independent effect over and above that which they shared with mothers. They supported the influence of parental beliefs and perceptions on student perceptions of their abilities, and, thus, on their education and career plans. They found that parents perceived mathematics to be harder for their

daughters and that parents believed that their daughters had to work harder to do well in mathematics. Stallings (1985) concluded that parents were perhaps the most important factor for women as well as men in continuing their mathematics studies.

With regard to the careers and education level of the parents, Armstrong (1985) showed that the components of socioeconomic status, parents education and occupation, were significantly correlated with course taking for both sexes. Lantz and Smith (1981) concluded that fathers education appeared to be the best socioeconomic status predictor of mathematics participation for both sexes. The prestige and mathematics level of the father's occupation were found to be significantly related to the amount of mathematics taken by the daughter (Wise, 1985). It has been found that daughters who identify with their fathers, or who have working mothers, tend to enroll in higher level mathematics courses (Astin, 1974; Astin, Harway, & McNamara, 1976). Casserly and Rock (1985) found that the mother's education and the mother's encouragement directly affected the occupational stereotyping for women in the advanced placement program. They found that the father's education was also related to occupational stereotyping. Ethington and Wolfle (1984) concluded that the father's and mother's education were considered to reflect not only the unique effects of parental education but of attitudes and ability as well. They concluded that the mother's attitudes and education did not play a significant role.

Objectives of the study

We have briefly reviewed evidence that

1. Student perception of mathematics as a male domain was significantly related to mathematics achievement and to participation in mathematics courses.

2. Parent perception of mathematics as a male domain correlated significantly with the child's perception of mathematics as a male domain.

3. Parent education was considered to reflect attitudes and ability and was significantly correlated with mathematics course taking for both sexes.

4. The status of a career as being male dominant may affect the perception of its usefulness as well as its appropriateness for either or both sexes.

The work of Meece, Parsons, Kaczala et al (1982) pointed to the importance of ascertaining the origins of students' perceptions of the expectations of their parents and teachers because student perception of parents' attitudes appeared to affect student perceptions of their own abilities more than their own past performances. They indicated that it was unclear whether these perceptions were a reflection of cultural stereotypes or a direct consequence of parental attitudes and behavior.

The pivotal nature of the perception of mathematics as a male domain, reflecting cultural, educational, and attitudinal dimensions, positions it as a worthwhile and interesting variable for further study. Precisely because of its pivotal nature,

research involving mathematics as a male domain often produced some statement of a statistically significant relationship. We propose in this study to add a degree of specificity to the relation between student attitude toward mathematics as a male domain and parent career variables by utilizing the parents' attitudes toward mathematics and the sex of the student as intervening variables. We propose to carry out this investigation from two quite dissimilar perspectives: a) a comparison across specific career categories, and b) the evaluation and interpretation of a hypothesized causal model relating the variables. The comparison across career categories will permit demonstration of parent/child differences or similarities with respect to perception of mathematics as a male domain. The purpose of the causal model perspective is twofold: a) to determine the extent to which parent career variables can be said to cause attitudes toward mathematics as a male domain; and b) to determine if the relation between parent and student attitude toward mathematics as a male domain, in the content of the model, are direct, indirect, or spurious.

Procedure

Regression techniques including Scheffé's Test were used to determine differences in across career categories (see, for example, Pedhazur, 1982, pgs 309-316). The statistical procedure, and computer program, LISREL, was used to evaluate the fit of the hypothesized model to the data. LISREL is a general computer program for estimating the unknown coefficients in a set of linear structural equations (Jöreskog & Sörbom, 1984). The model assumes a

structure among a set of latent variables. The latent variables may be viewed as causes of observed variables. The LISREL model consists of two parts: the structural equation model and the measurement model. The structural equation model specifies the casual relationships among the latent variables and is used to describe the causal effects and the amount of unexplained variances. The measurement model specifies hov the latent variables are measured in terms of the observed variables and is used to determine the measurement properties of the observed variables. LISREL does not provide a uniqueness property of a model; it can only affirm that the model is consistent with the data. Readers unfamiliar with LISREL may want to refer to articles by Lomax (1982) and Wolfle (1982) or to Chapter 16 of Pedhazur (1984).

Structural Model

The model of student attitude toward mathematics as a male domain proposed in this paper is diagrammed in Figure 1. As is customary with such models, single-headed arrows represent hypothesized nonzero causal effects. The arrov points from the predetermined variable to the variable influenced

---

Insert Figure 1 about here

---

by it. Variables in the structural model are specified as either exogenous or endogenous. Exogenous variables are variables, the causes of which, come from outside the model at hand. Endogenous variables, on the other hand, are hypothesized to have explicit

causes represented in the model. The two parent education variables, the two parent male dominance indices, and sex are considered exogenous variables. The endogenous variable are the two parents' attitudes toward mathematics as a male domain and the student's attitude toward mathematics as a male domain.

The causal model represented in Figure 1 assumed the student's attitude toward mathematics as a male domain to be a function of the two parent's attitudes toward mathematics as a male domain, the sex of the child, and an error term. The father's attitude toward mathematics as a male domain was considered to be influenced by the male dominance index of the fathers' occupation, the education level of the father, the sex of the child, and an error term. The mother's attitude toward mathematics as a male domain was considered to be influenced, similarly, by the male dominance index of the mother's occupation, the education level of the mother's occupation, the sex of the child, and an error term. Pairwise covariances between the error terms were assumed to be equal to zero in the initial model.

These relationships may be specified by the following matrix equation:

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ \beta_{31} & \beta_{32} & 0 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & 0 & 0 \\ 0 & 0 & \gamma_{23} & \gamma_{24} & \gamma_{25} \\ 0 & 0 & \gamma_{33} & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \end{bmatrix}$$

Measurement Model

It is customary in applying LISREL to distinguish between latent and manifest variables. Latent variables are unmeasured, unobserved variables. Manifest variables are measured, observed variables. In the proposed model, we are considering the manifest variables to be accurate measures of the latent variables. Even though it is customary to enclose latent variables in ellipses and manifest variables in rectangular figures, the proposed model includes only manifest variable representation to simplify the diagram.

Data

A total of 1942 seventh and eighth grade students, 945 females and 997 males, from 13 midwestern junior high schools, and their parents participated in the study. The variables were student attitude toward mathematics as a male domain, the two parents' attitudes toward mathematics as a male domain, the male dominance index of each parent's occupation, the education level associated with each parent's occupation, and the sex of the child. Student attitude toward mathematics as a male domain was measured by the Mathematics as a Male Domain Subscale of the Fennema Sherman Mathematics Attitude Scales (Fennema & Sherman, 1976). A modified version of the Mathematics as a Male Domain subscale was used to measure parent perception of mathematics as a male domain. Parent career data were gathered through a questionnaire sent to parents. The response rate was over 80% in all of the participating schools.

Parent careers were grouped according to the Holland classification of occupations (Holland, 1977). The career groups were management, business operations, trades and technology, science, and service. A sixth career catagory, housewife, was added for mothers. An education level was assigned to each occupation in accordance with Holland (1977). Parent careers were also assigned a male dominance index (MDI) from 0 to 99 (Harren, Kass, Tinsley, & Moreland, in press). The MDI value represents the proportion of men in a given career. Higher values indicate fields that are more male-dominant.

Analysis and results

The means, standard deviations, and correlation coefficients for all students for the parents' attitude toward mathematics as a male domain, the MDI of each parent's occupation, the education level of each parent's occupation, and the student's attitude toward mathematics as a male domain appear in Table 1. Table 2 contains the means, standard deviations, and correlations by sex of the student of parent attitudes toward mathematics as a male domain, MDI of parent's occupations, and the student's attitude toward mathematics as a male domain.

Insert Table 1 about here

Insert Table 2 about here

Correlation coefficients significantly different from zero are

marked in Table 2. The significant negative correlation between the son's attitude toward mathematics as a male domain and the MDI of the father's occupation indicated that the more highly male dominant was the father's career the more the son perceived mathematics to be a male domain. T-tests were used to determine that there was a significant difference ($p \leq .05$) between the mean score on attitude toward mathematics as a male domain for mothers of daughters and the mean score for mothers of sons. The mean score on attitude toward mathematics as a male domain was significainly higher ($p \leq .05$) between the mean score on attitude toward mathematics as a male domain for mothers of daughters and the mean score for mothers of sons. Similarly, the mean score on attitude toward mathematics as a male domain was significantly higher ($p \leq +.05$) for fathers of daughters than for fathers of sons.

The relationship between the mother's or father's career category and their children's attitude toward mathematics as a male domain were investigated. The means of the parent responses and the means of the student responses on their attitude toward mathematics as a male domain are grouped by sex and by parent career category in Table 3 (fathers) and in Table 4 (mothers). The results of regression analysis are the following

---

Insert Table 3 about here

Insert Table 4 about here

(significant differences ($p \leq .05$) imply that the F-statistic for the regression equation was significant):

1. Mothers and fathers with careers in management, business operations, and service reported less stereotyping of mathematics as a male domain than did parents with careers in trades and technology and in science.

2. The perception of mathematics as a male domain by fathers in business operations differed from that of fathers in the sciences.

3. The perception of mathematics as a male domain by mothers who were housewives differed from the perception of mothers who were not housewives.

4. The daughters' attitudes toward mathematics as a male domain appeared to be patterned after both parents, with daughters reporting less stereotyping of mathematics as a male domain if one of her parents had a career in management, business operations, or service.

5. Sons exhibited less stereotyping of mathematics as a male domain if the father had a career in management, business operations, or service. The attitude of sons whose mothers were in these career categories was not more positive toward mathematics as a male domain than that of other sons.

6. The perception of mathematics as a male domain by sons of fathers in the service category differed from that of sons of fathers in trades and technology.

7. The attitude toward mathematics as a male domain by either sons or daughters did not differ according to whether or not the mother listed herself as a housewife. Thus, while the mothers who listed themselves as housewives did perceive mathematics to be more of a male domain than those mothers who did not, this difference was not carried to the child, whether male or female.

Causal model analysis

LISREL VI (Jöreskog & Sörbom, 1984) was the method of analysis. Study variables were standardized. Thus, the correlation matrix in Table 1 was the input matrix for the model as shown in Figure 1. The maximum likelihood estimation of the path coefficients for this model resulted in a likelihood-ratio chi-square statistic of 207.71 with 9 degrees of freedom. The goodness of fit index for the model was 0.959 with an adjusted (for degrees of freedom) goodness of fit index of 0.837. The chi-square statistic associated with LISREL evaluation of a causal model measures distortion of the path coefficients, as determined by the proposed model, from the actual path coefficients determined by the data. Thus, a lower chi-square statistic relative to the degrees of freedom indicates that the model is more consistent with the data. The goodness of fit index is a value M, $0 \leq M \leq 1$, which represents a ratio that is dependent on the variances of the residuals of the model being evaluated. The goodness of fit index is a measure of the relative amount of variances and covariances jointly accounted for by the model (Jöreskog & Sörbom, 1984). Its statistical distribution is unknown.

A chi-square value of 207.71 with 9 degrees of freedom was judged not to be representative of the data. Examination of the modification indices indicated that a maximum change in the chi-square statistic would occur if the value of the path coefficient for the path from father's attitude toward mathematics as a male domain to mother's attitude toward mathematics as a male domain, β_{21}, was assumed to be non-zero. The freeing of β_{21} was viewed as consistent with the theory as well as consistent with the objective of developing a causal model that best fits the data.

When the model was reestimated, the value of the chi-square statistic was 45.35 with 8 degrees of freedom. The model was estimated a third time under the assumption that the path coefficient of the path from father's education level to mother's attitude toward mathematics as a male domain was non-zero. The resulting model had a chi-square value of 31.21 with 7 degrees of freedom. Further modifications, by defining non-null paths or by allowing error terms to covary, resulted in models which did not appear to fit the data.

In examining the t-values of the path coefficients estimated for the third model, it was judged that neither the path coefficient for the path from sex to mother's attitude toward mathematics as a male domain nor the path coefficient for the path from the MDI of the mother's occupation to the mother's attitude toward mathematics as a male domain were significantly different from zero. A fourth model was estimated under the assumption that these path coefficients were both zero. The chi-square statistic for this

model was 34.02 with 9 degrees of freedom. The difference between the third model and the fourth model was judged not to be significant (χ^2 = 2.84; df = 2). The fourth model was judged to be consistent with the data and was accepted as a "best fitting" model for the data. The goodness of fit index was 0.971.

Figure 2 contains a diagram of the model accepted as best fitting the data. Parameter estimates are indicated on the paths. The values of R^2 for the structural equations is shown under the respective variables.

Insert Figure 2 about here

The structural equations resulted in explaining 20% of the variance of student attitude toward mathematics as a male domain, 17% of the variance of the mother's attitude toward mathematics as a male domain, and 3% of the variance of the father's attitude toward mathematics as a male domain. Table 5 contains the initial estimates, the standardized path coefficient estimates, and the standard errors for each estimate.

Insert Table 5 about here

Several obervations concerning the model can be made:

1. The MDI of the mother's occupation was not casually related to any variable in the model.

2. The sex of the child did not affect the mother's attitude toward mathematics as a male domain.

3. The sex of the child had a direct effect (.377) and a quite small indirect effect (approximately .01), through the father's attitude toward mathematics as a male domain, on the student's attitude toward mathematics as a male domain.

4. The father's attitude toward mathematics as a male domain had a direct effect (.082) and an indirect effect (.058), through the mother's attitude toward mathematics as a male domain, on the student's attitude toward mathematics as a male domain.

5. The negative path coefficient from the MDI of the father's occupation to the fathers attitudes toward mathematics as a male domain indicated that fathers who were employed in predominantly male occupations perceived mathematics to be more of a male domain than did fathers in less male dominated occupations.

The model provides a quantitative interpretation of several correlational relationships. One of the most immediate is that the causal effect of father's attitude toward mathematics as a male domain on the student's attitude toward mathematics as a male domain is split between direct effects and indirect effects. Approximately half of the influence of the father is felt through the intervening variable of the mother's attitude toward mathematics as a male domain. There is no causal link from the sex of the student to the mother's attitude; the responses of the father are sex-differentiated but the responses of the mother are not. There is a causal link from the MDI of the father's occupation to the student's

attitude, but there is none from the MDI of the mother's occupation to the child's attitude.

The relatively large path coefficients from the residuals are unsatisfactory from the point of view of explaining student attitude toward mathematics as a male domain as a funtion of parent occupation variables. The explanatory function of the model would certainly have been increased had variables such as student mathematics achievement, student self-confidence toward mathematics, and similar such variables been allowed to enter the model. We would, however, have defeated the purpose of the study which was to uncover causal relationships among parent career variables and parent and student attitude toward mathematics as a male domain.

Conclusions

We noted that, whereas mothers who listed themselves as housewives perceived mathematics to be more of a male domain than did mothers who worked outside the home, this difference in perception of mathematics was not found in either their sons or daughters. Parents in the career categories of management; business operations, and service, and their children, whether male or female, viewed mathematics as less of a male domain than their counterparts in science and trades and technology.

The model of student attitude toward mathematics as a male domain was interesting for the causal effects which it did explain as well as the relationships it did not explain. The MDI of the parents' occupations and the education level associated with the

occupation appear to be indirect causes of the student's attitude toward mathematics as a male domain. We were able to exhibit a relationship between parent attitudes toward mathematics as a male domain and the student's attitude toward mathematics as a male domain which was not explained by the model. We must look elsewhere for an explanation of this relationship.

There are several implications from this study. The first is that parent career choices are related to parent and children's view of mathematics as a male domain. The second is that this relationship cannot be fully explained through variables associated with education level and male dominance of parent occupation. The variable of sex is able to provide some explanation. It may be true, however, that the student's perception of mathematics as a male domain involves self-perception and self-values to such an extent that the causal model arrived at in this study is one of the best fitting that can be found relating parent career and attitude variables.

References

Armstrong, J. M. (1985). A rational assessment of participation and achievement of women in mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds), Women and mathematics: Balancing the equation. Hillsdale, NJ: Lawrence Erlbaum Associates.

Armstrong, J. M, & Price, R. A. (1982). Correlates and predictors of women's mathematics participation. Journal for Research in Mathematics Education, 13, 99-109.

Astin, H. S. (1974). Sex differences in mathematical and scientific precocity. In J. C. Stanley, D. P. Keating, & L. H. Fox (Eds), Mathematical talent: Discovery, description, and development. Baltimore: Johns Hopkins University Press.

Astin, H. S., Harway, M., & McNamara, P. (February, 1976). Sex discrimination in education: Access to post-secondary education. Washington, D.C.: National Center for Education Statistics, U.S. Department of Health, Education, and Welfare.

Boswell, S. L. (1985). The influence of sex-role stereotyping on women's attitudes and achievement in mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds), Women and Mathematics: Balancing the equation. Hillsdale, NJ: Lawrence Erlbaum Associates.

Casserly, P. L., & Rock, D. (1985). Factors related to young women's persistence and achievement in advanced placement mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds), Women and mathematics: Balancing the equation. Hillsdale, NJ: Lawrence Erlbaum Associates.

Eccles (Parsons), J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., and Midgley, C. (1985). Self-perceptions, task perceptions, socializing influences, and the decision to enroll in mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds), Women and mathematics: Balancing the equation. Hillsdale, NJ: Lawrence Erlbaum Associates.

Ethington, C. A., & Wolfle, L. M. (1984). Sex differences in a causal model of mathematics achievement. Journal for Research in Mathematics Education, 15, 361-377.

Fennema, E. & Sherman, J. (1976). Fennema-Sherman Mathematics Attitude Scales. Psychological Documents, 6(2), 31. (MS no. 1225).

Fennema, E. H. & Sherman, J. A. (1977). Sex-related differences in mathematics achievement, spatial visualization, and affective factors. American Educational Research Journal, 13, 51-71.

Harren, A., Kass, R. A., Tinsley, H. E. A., & Moreland, J. R. (In press). Influence of gender, sex-role attitudes, and cognitive complexity on gender-dominant career choices. Journal of Counseling Psychology.

Holland, J. L. (1977). The Occupations Finder. Palo Alto, CA: Consulting Psychologists Press.

Jöreskog, K. G. & Sörbom, D. (1984) LISREL VI: Analysis of linear structural relationships by the method of maximum likelihood; User's guide. Mooresville, IN: Scientific Software, Inc.

Lantz, A. E., & Smith, G. P. (1981). Factors influencing the choice of nonrequired mathematics courses. Journal of Educational Psychology, 73, 825-837.

Lomax, R. G. (1982). Methods & designs: A guide to LISREL-type structural equation modeling. Behavior Research Methods & Instrumentation, 14, 1-8.

Meece, J. L., Parsons, J. E., Kacala, C. M., Goff, S. B., & Futterman, R. (1982). Sex differences in math achievement: Toward a model of academic choice. Psychological Bulletin, 91(2), 324-348.

Parsons, J. E., Adler, T. F., & Kaczala, C. M. (1982). Socialization of achievement, attitudes and beliefs: Parental influences. Child Development, 53, 310-321.

Pedhazur, E. J. (1982). Multiple regression in behavioral research (2nd ed.). New York: Holt, Rinehart and Winston.

Poffenberger, T. & Norton, D. (1959). Factors in the formation of attitudes toward mathematics. Journal of Educational Research, 52, 171-176.

Sherman, J. (1981). Girls' and boys' enrollments in theoretical math courses: A longitudinal study. Psychology of Women Quarterly, 5, 681-689.

Stallings, J. (1985). School, classroom and home influences on women's decisions to enroll in advanced mathematics courses. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation. Hillsdale, NJ: Lawrence Erlbaum Associates.

Wilhelm, S. & Brooks, D. M. (1980). The relationship between pupil attitudes toward mathematics and parental attitudes toward mathematics. Educational Research Quarterly, 5, 8-16.

Wise, L. L. (1985). Project TALENT: Mathematics Course Participation in the 1960's and its career consequences. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds), Women and mathematics: Balancing the equation. Hillsdale, NJ: Lawrence Erlbaum Associates.

Wolfle, L. M. (1982). Causal models with unmeasured variables: An introduction to LISREL. Multiple Linear Regression Viewpoints, 11, 9-54.

Table 1

Correlations, Means, and Standard Deviations of Variables

Variables	1	2	3	4	5	6	7	8
(1) Father-Male Domain	1							
(2) Mother-Male Domain	.370	1						
(3) Student-Male Domain	.181	.222	1					
(4) Father MDI	-.101	-.063	-.099	1				
(5) Father Education	.110	.162	.146	-.110	1			
(6) Sex	.102	.076	.398	.046	-.003	1		
(7) Mother MDI	.032	.083	.025	-.048	.154	-.016	1	
(8) Mother Education	.039	.149	.070	-.122	.174	-.006	.609	1
M	4.195	4.415	3.992	85.641	4.051	1.478	13.084	2.084
SD	0.588	0.503	.672	23.123	1.015	.500	26.667	2.075

Table 2

Correlations, Means, and Standard Deviations by Sex of Student of Selected Variables

Variables	1	2	3	4	5
(1) Father-Male Domain	-	.33[a(*)]	-.09	.00	.18*
(2) Mother-Male Domain	.39[b(*)]	-	-.06	.10	.30*
(3) Father MDI	-.12	-.07	-	-.06	-.04
(4) Mother MDI	.06	.07	-.03	-	.08
(5) Student-Male Domain	.14	.15	-.20*	.00	-
M[c]	4.26	4.46	86.75	12.67	4.27
SD[c]	.56	.50	22.48	26.08	.55
M[d]	4.14	4.38	84.61	13.51	3.74
SD[d]	.61	.51	23.68	27.25	.67

[a] Upper triangle shows correlations from female data

[b] Lower triangle shows correlations from male data

[c] Means and standard deviation from female data

[d] Means and standard deviations from male data

* $p \leq .01$

Table 3

Means of Student and Father's Attitude Toward Mathematics as a Male Domain by Father's Career Category

	Father's Career Category				
	Management	Business Operations	Trends and Technology	Science	Service
Father-Male Domain	4.26	4.33	4.15	4.11	4.29
	n=312	n=106	n=702	n=31	n=194
Fathers of Daughters-Male Domain	4.33	4.39	4.20	4.21	4.39
	n=138	n=45	n=341	n=19	n=91
Father of Sons-Male Domain	4.21	4.28	4.10	3.94	4.20
	n=173	n=61	n=359	n=12	n=103
Daughters-Male Domain	4.36	4.30	4.22	4.50	4.38
	n=153	n=48	n=403	n=20	n=101
Sons-Male Domain	3.77	3.79	3.65	3.86	3.97
	n=195	n=64	n=419	n=14	n=118

Table 4

Means of Student and Mother's Attitude Toward Mathematics as a Male Domain by Mother's Career Category

	Mother's Career Category					
	Management	Business Operations	Tech-nology	Science	Service	House-wife
Mother-Male Domain	4.53 n=129	4.47 n=233	4.38 n=206	4.37 n=21	4.52 n=316	4.35 n=751
Mothers of Daughters-Male Domain	4.61 n=62	4.47 n=111	4.38 n=92	4.41 n=8	4.61 n=145	4.39 n=368
Mother of Sons-Male Domain	4.46 n=67	4.48 n=121	4.38 n=113	4.34 n=13	4.45 n=171	4.31 n=381
Daughters-Male Domain	4.43 n=63	4.32 n=115	4.20 n=100	4.11 n=8	4.38 n=154	4.23 n=380
Sons-Male Domain	3.67 n=69	3.81 n=126	3.66 n=123	3.83 n=14	3.82 n=177	3.74 n=399

Table 5

Parameter Estimates for the Best Fitting Model

Parameter	Initial Estimate	Estimates (Maximum Likelihood)
β_{21}	.582	.354 (.027)[a]
β_{31}	.916	.082 (.029)
β_{32}	.276	.163 (.029)
γ_{11}	-.095	-.095 (.029)
γ_{12}	.100	.100 (.029)
γ_{13}	.107	.107 (.029)
γ_{22}	.078	.102 (.029)
γ_{25}	.113	.117 (.028)
γ_{33}	.284	.377 (.027)
Ψ_{11}	.968	.968 (.041)
Ψ_{22}	.886	.835 (.035)
Ψ_{33}	1.568	.799 (.034)

[a] Standard errors are in parentheses

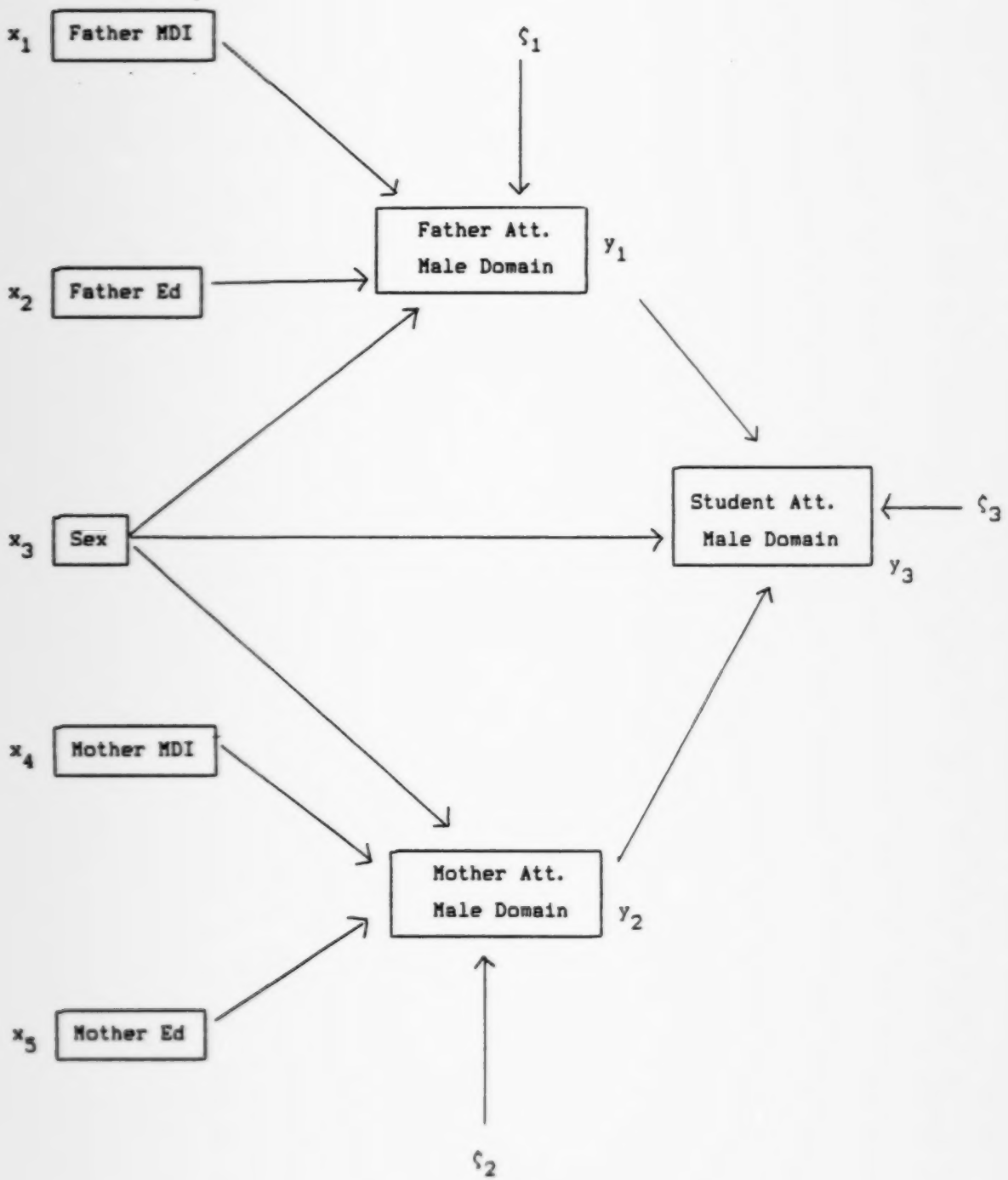

Figure 1. Hypothesized causal model of student attitude toward mathematics as a male domain.

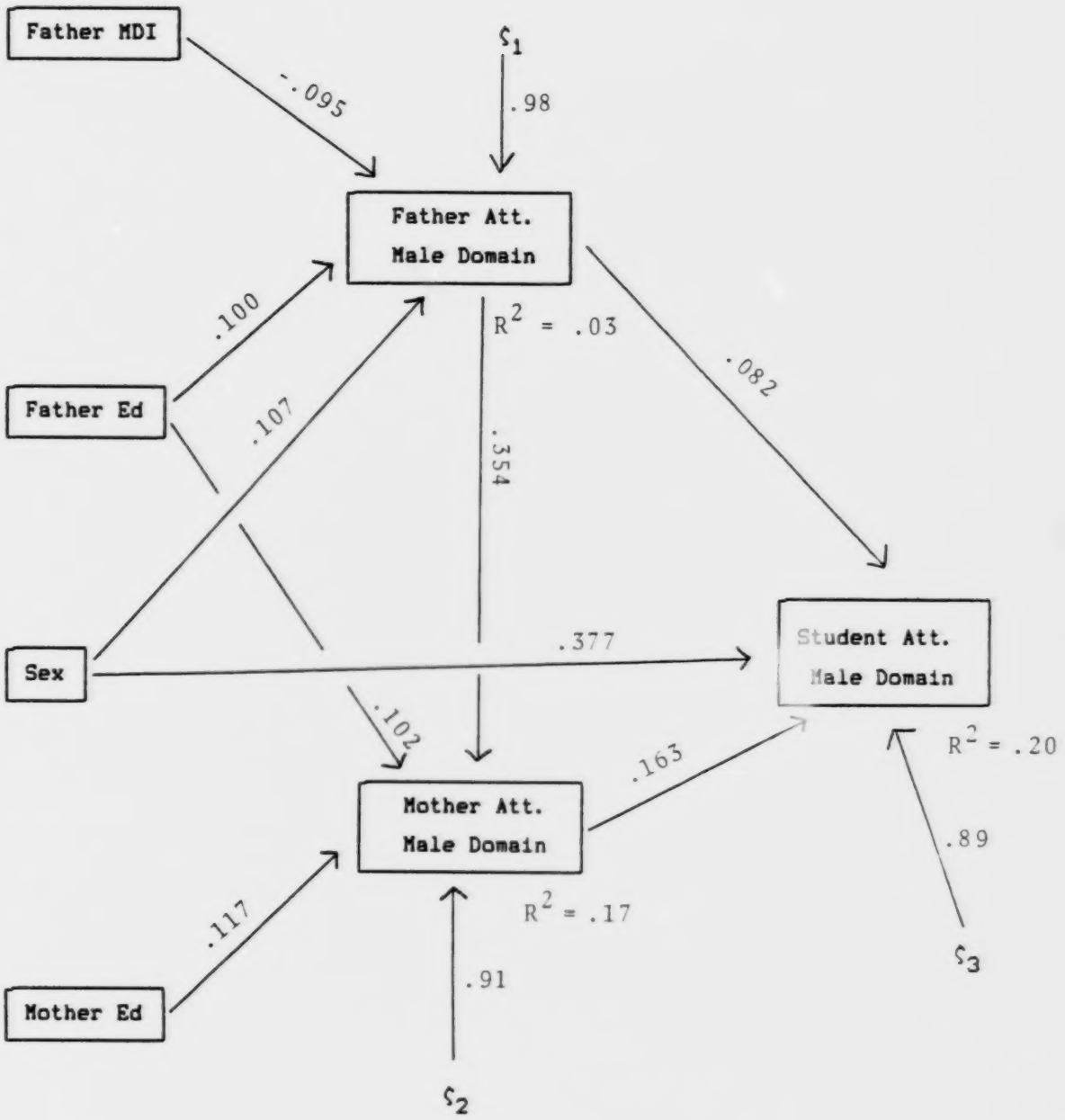

Figure 2. Best Fitting Model of Student Attitude Toward Mathematics as a Male Domain